1214595 COMPLETE SPECIFICATION
1 SHEET This drawing is a reproduction of the Original on a reduced scale

Fig. 1

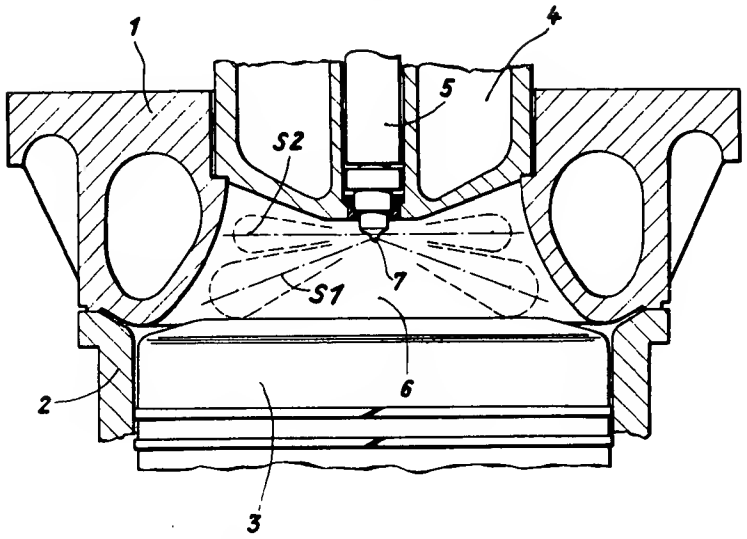


Fig. 2

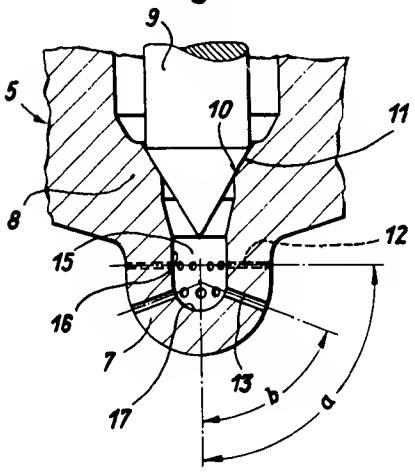
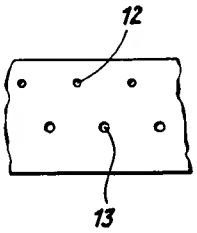


Fig. 3



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(54) AN INTERNAL COMBUSTION ENGINE INJECTION VALVE NOZZLE

(71) We, SULZER BROTHERS LIMITED, a Company organised under the Laws of Switzerland, of Winterthur, Switzerland, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The invention relates to an internal combustion engine fuel injection valve nozzle.

According to the present invention an internal combustion engine fuel injection valve nozzle includes a valve seat and two circumferential rows of injection ports, the ports in one row being circumferentially offset from the ports in the other row, the inner wall of the nozzle between the valve seat and the end of the nozzle having a portion which contains at least one of the rows of ports and forms in axial section, a smaller angle with the longitudinal axis of the valve nozzle than the surface of the valve seat.

In such an arrangement the valve seat taking the impact when the valve needle meets the seat is sufficiently far away from the part of the nozzle containing the injection ports that the part of the nozzle can be appropriately dimensioned to give the necessary length and diameter of injection ports without regard to strength. There is also complete freedom of choice of the inclination of the ports. There is no difficulty in sealing off the valve seat, since the surface of the seat does not carry the ports.

Preferably the portion of the wall of the nozzle is cylindrical and is coaxial with the valve seat and through which there extend injection ports which are perpendicular to the valve axis, this being advantageous for the injection of fuel into flat disc-shaped combustion chambers.

The invention may be carried into practice in various ways and one embodiment will now be described by way of example with reference to the accompanying drawings, of which:—

Figure 1 is a longitudinal section of a combustion chamber of a diesel engine:

Figure 2 is a detail of Figure 1 showing the nozzle tip to an enlarged scale and in partial section, and

Figure 3 is a development of the periphery of the nozzle tip shown in Figure 2.

Figure 1 shows a longitudinal section of a cylinder head 1 of a diesel engine connected to a cylinder liner 2. A piston 3 is movable in the cylinder liner. The cylinder head 1 has an insert 4, the centre of which contains an injection valve 5. The cylinder head 1, the liner 2, the piston 3 and the insert 4 and the ports which it carries enclose a compression chamber 6. The lower end of the injection valve 5 contains a nozzle tip 7 from which fuel is injected, during the injection operation, into the compression chamber 6 in the direction of the streams S1 and S2.

Figure 2 shows the lower end of the injection valve 5 with the nozzle tip 7 in section and to an enlarged scale. In this case, the nozzle tip 7 is constructed as part of a nozzle 8 which contains a valve needle 9. The needle 9 and the nozzle 8 are provided with a sealing surface 10 and a valve seat 11 respectively, which together form the sealing closure for the valve.

The nozzle jet 7 formed at the bottom of the nozzle 8 contains injection ports 12 and 13 disposed in two rows at the periphery of the nozzle tip 7. As will be apparent from the developed view in Figure 3, the ports 12 and 13 in the two rows are circumferentially offset from one another. The axes of the ports 12 nearer the valve seat 11 form an angle a with the longitudinal axis of the valve, and this angle is larger than the angle b formed with the longitudinal axis of the valve by the axes of the ports 13 farther away from the valve seat 11. In the drawing, the angle a is approximately a right angle.

As will be apparent from Figures 2 and 3, a cavity 15 is formed between the valve seat 11 and the ports 12, 13, the ports leading out through the inner wall 17 of the cavity. Over most of its length, i.e. with the exception of the lower spherical portion, the inner wall 17 extends in such a manner that in axial section it forms a smaller angle with the longitudinal axis of the valve than does the seat surface 11. In the construction illustrated, the wall has a cylindrical portion 16 coaxial with the valve seat 11. The ports 12, which are perpendicular to the valve axis, lead out from the portion 16.

The region of the nozzle tip containing the ports 12 and 13 is spaced from the region of the casing containing the valve seat 11. The latter region may have a much greater wall thickness than the region containing the ports 12 and 13. The latter also extend independently of the inclination of the valve seat surface. For example, the ports 12 perpendicular to the cylindrical surface 16 may be perpendicular to the axis of the injection valve 5 and their streams of fuel can reach the horizontal furthermost regions of the disc-shaped combustion chamber shown in Figure 1.

The staggered arrangement of ports in two rows in the nozzle tip has the result that the fuel is divided up into a number of streams of the required fineness, without interfering with one another. Thus, the fuel can be satisfactorily mixed with air throughout the combustion chamber.

WHAT WE CLAIM IS:—

1. An internal combustion engine fuel injection valve nozzle including a valve seat and two circumferential rows of injection ports, the ports in one row being circumferentially offset from the ports in the other row, the inner wall of the nozzle between the valve seat and the end of the nozzle having a portion which contains at least one of the rows of the ports and forms in axial section, a smaller angle with the longitudinal axis of the valve nozzle than the surface of the valve seat.

2. A nozzle as claimed in Claim 1 in which the said portion of the wall is cylindrical and is co-axial with the valve seat, the ports in the portion being substantially perpendicular to the axis of the nozzle.

3. An internal combustion engine fuel injection valve nozzle substantially as described herein with reference to and as shown in the accompanying drawings.

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